M300
Battery Charger

For lead-acid batteries

User Manual and Guide to professional charging of starter and deep cycle batteries.

EN

INTRODUCTION

Congratulations on purchasing your new CTEK professional switch mode battery charger. This charger is part of a range of professional battery chargers from CTEK SWEDEN AB. It represents the latest technology in battery charging with charging and analysis in eight steps with temperature compensation. Read this User Manual and follow the instructions carefully before using your new charger.

SAFETY

- The charger is designed for lead-acid batteries. Do not use the charger for any other purpose
- Use safety glasses and turn your head away when connecting or disconnecting a battery.
- Battery acid is corosive. Rinse immediately with water if acid comes into contact with skin or eyes. Seek medical advice.
- Make sure that the cable is not being pinched or in contact with warm surfaces or sharp edges.
- While charging, a battery can emit explosive gases, so it is important to avoid sparks in the immediate area.
- Always provide for proper ventilation during charging.
- Avoid covering the charger.
- Make sure that the electrical cable does not come into contact with water.
- Never charge a frozen battery.
- Never charge a damaged battery.
- Do not place the charger on the battery while charging.
- The electrical connection must fulfil the national heavy current requirements.
- Check the cabling in the charger before use. Make sure there are no cracks in the cabling or in the protective covering. A charger with damaged cables may not be used.
- Always check that the charger has gone over to maintenance charging mode before leaving the charger unattended and connected for long periods. If the charger had not gone over to maintenance charging within 3 days, this is an indication of a problem. In this case the charger must be disconnected manually.
- All batteries fail sooner or later. A battery that fails during charging is normally taken care of by the chargers advanced control, but certain uncommon errors in the battery can still arise. Don't leave the battery charger unattended for a longer period of time.
- Only mount the charger on a flat surface.
- This equipment may not be used by children or by those who can not read and understand the manual if they are not supervised by a responsible person who can guarantee that the battery charger is being used in a safe manner. Store and use the battery charger out of the reach of children. Make sure that children do not play with the battery charger.
- When using outdoors the charger has to be positioned horizontally with the long side or top side turned up.

CHARGING

Connecting the charger to a battery fitted in a vehicle

1. The power cord should be disconnected when connecting or disconnecting the battery leads.
2. Identify the battery terminal that is grounded (connected to the chassis). The negative terminal is normally the grounded post.
3. Charging a negatively grounded battery. Connect the red cable to the positive terminal on the battery and the black cable to good metal engine ground away from the battery. Ensure you do not connect the black cable to fuel lines or sheet-metal body parts.
4. Charging a positively grounded battery. Connect the black cable to the negative terminal on the battery and the red cable to good metal engine ground away from the battery. Ensure you do not connect the black cable to fuel lines or sheet-metal body parts.

Connecting the charger to an out of vehicle battery:

1. The power cord should be disconnected when connecting or disconnecting the battery leads.
2. Connect the red cable to the positive terminal on the battery and the black cable to the negative terminal.

If the battery leads have been connected incorrectly, the reverse polarity protection system will ensure that neither the charger nor the battery are damaged.

Start charging

1. Connect the charger´s AC cord to an AC Power Supply. The charger will indicate POWER, yellow indication lamp (B).
2. The lamp for completely discharged battery (1) will illuminate if the battery's voltage is less than 12V.
3. Normal charging will be indicated by the following lights: completely discharged battery (1), bulk charging (2), absorption charging (3) or maintenance charging (4). When the maintenance charging lamp illuminates the battery is fully charged. Charging will start if the voltage drops. The charger can normally be connected for months. Reconditioning is indicated by the lamp (5) illuminating.
4. If the battery leads have been connected incorrectly, the reverse polarity protection system will ensure that neither the charger nor the battery are damaged.
5. If nothing happens. If the lamp indicating the setting and the power lamp remain lit but no other lamp illuminates, the connection to the battery or chassis may be poor or the battery may be faulty. Another cause may be a lack of voltage in the AC Power Supply. Begin by improving the connection between the battery and charger.
6. Charging can be stopped at any time by disconnecting the charger's AC cord. Always disconnect the AC cord before disconnecting the battery leads. When you stop charging a battery installed in a vehicle you should always disconnect the battery lead from the chassis before disconnecting the other battery lead.

BATTERY TYPES AND SETTINGS

M300 can easily be set for different types of batteries or conditions. The following recommendations should, however, only be seen as guidelines. Please consult the battery manufacturer for further instructions.

Settings are made by pressing the “MODE-button “ and stepping forward one press at a time until the required mode is reached, the button is then released. After about 2 seconds the charger activates the selected mode. The selected mode is saved in a memory in the charger and remains there even if the charger is disconnected from battery and mains.

NORMAL	NORMAL - Normal setting for wet batteries, maintenance free and for most Gel batteries. Some Gel batteries prefer a slightly lower charging voltage. Please consult the battery manufacturer when in doubt.
NIGHT	NIGHT – This mode is equal to NORMAL, but with reduced current. The built-in fan is disabled and the unit is almost silent. The Unit returns automatically to NORMAL after 8 hours. To ensure that the charger restarts in NIGHT mode in the event of a power failure the setting is stored in a memory. The indication shows “NIGHT” even if the charger has returned to NORMAL mode to remind that the charger will start in NIGHT mode next time.
RECOND	RECOND - This mode is used to recover deep discharged flooded batteries where you could expect a stratified acid (high acid weight in the bottom, low on top). Check with battery manufacturer when in doubt. Use this mode with care, because the high voltage will cause some water loss. 16V is normally no problem for electronics in 12V system. Consult your supplier when in doubt. Life of light bulbs will be reduced at higher voltage. Try to disconnect light from the battery during this phase. Maximum effect and minimum risk for electronics is achieved by charging a disconnected battery.

CHARGING PHASES

M300 charges and analyses in eight fully automatic steps. M300 has three different operating modes, see Battery Types and Settings.

The battery charger has an 8-step fully automatic charging cycle:

Desulphation
Desulphation with pulses recovers sulphated batteries. Indicates with lamp 1.

Soft start (Lamp 1)
Start mode for the charging cycle. The start phase continues until the battery’s terminal voltage has risen above the set limit, at which point the charger switches to bulk charging. If the terminal voltage has not passed the voltage limit within the time limit, the charger switches to fault mode (lamp 0) and discontinues the charging. If so, the battery is faulty or its capacity is too large.

Bulk (Lamp 2)
Main charge when 80% of charging takes place. The charger delivers maximum current until the terminal voltage has risen to the set level. Bulk has a maximum time, at which point the charger automatically switches to Absorption.

Absorption (Lamp 3)
Complete charge up to virtually 100%. The terminal voltage is maintained at the set level. During this phase the current tapers successively. Once the current has tapered to the set limit, this phase switches to being timed. If the total time for Absorption exceeds the time limit the charger automatically switches to maintenance.

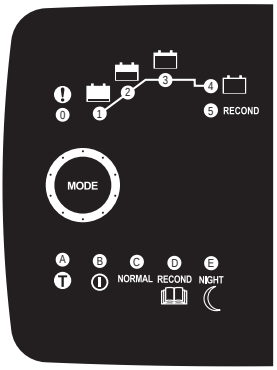
Analysis (Lamp 3)
Testing self-discharge. If self-discharge is too high, charging is discontinued and fault mode is indicated.

Maintenance charging - Float (Lamp 4)
Charging at constant voltage.

Maintenance charging - Pulse (Lamp 4)
Charging varies between 95% and 100% state of charge. The battery receives a pulse when the voltage drops and keeps the battery in perfect condition when it is not in use. The charger can be connected for months at a time. The charger continuously measures the terminal voltage to determine whether a charging pulse should be initiated. If the battery is loaded and/or the battery’s terminal voltage drops the charger starts a charging pulse until the terminal voltage reaches the set level. The charging pulse is then discontinued and the cycle is repeated infinitely. If the terminal voltage drops below a lower limit, the charger automatically goes back to the beginning of the charging curve.

Recond (Lamp 5)
This mode is used to recover deeply discharged flooded batteries. Recondition of deep discharged batteries. The voltage increases with reduced current for a limited time period. The higher voltage starts some gassing and mixing of the acid, which is beneficial for both battery capacity and expected life. Note that the battery could emit explosive gas during Recond. Recond is performed between Analysis and Maintenance.

INDICATORS



Lamp	Description
0	Fault mode, the charging is discontinued. For fault causes, see below.
1	Start mode
2	Bulk charging
3	Absorption charging
4	Maintenance charging
5	Recond, reconditioning of completely discharged batteries.
A	Charging with temperature compensation.
B	Mains voltage connected
C	Normal
D	Recond
E	Night. Charging with reduced power and disabled fan for 8 hours.

Fault mode

The charger goes to fault mode in the following situations:

- The battery is connected with poles reversed to the charger's terminals.
- The charger's analysis function has interrupted charging.
- The terminals on the charger are short-circuited after charging has started.
- The charger has been in start mode for more than 4 hours.

TEMPERATURE COMPENSATION

M300 has a sensor cable placed together with the battery cables. The units will automatically adjust the charging voltage if the temperature deviates from +25°C. A high temperature lowers the voltage and freezing conditions is handled by higher voltage.

The temperature is best measured on or very close to the battery. Therefore always place the sensor as close to the battery as possible when charging. The sensor cable could be prolonged or cut to length with the same functionality. Activated temperature sensor will be indicated by a lit temperature sensor indicator lamp. The charging voltage is then adjusted to the +25°C condition.

SPECIFICATION

Model	1013
Voltage AC	170–260VAC, 50–60Hz.
Charging voltage	14.4V
Charging current	25A max.
Current, mains	2.9A rms (at full charging current)
Back Current Drain*	<2Ah per month
Current ripple**	<4%
Ambient temperature	-20°C – +50°C Output power is automatically reduced at higher temperatures.
Cooling	Fan
Charger type	Eight-step, fully automatic
Battery types	All types of 12V lead-acid batteries (WET, MF, AGM and GEL).
Battery capacity	50–500Ah
Protection class	IP44 (Outdoor use)***
Weight	1.4kg

*) Back current drain is the current that the charger drains from the battery if the AC cord is disconnected.
**) The quality of the charging voltage and charging current are very important. High current ripple heats the battery and ages the positive electrode. High voltage ripple can damage other equipment connected to batteries. The battery chargers from CTEK produces very high quality voltage and current with low ripple.
***) IP44 cannot be guaranteed if the charger is not positioned horizontally with the long side or top side turned up.

MAINTENANCE

The charger is maintenance-free. The charger must not be opened; doing so will invalidate the warranty. If the power cable is damaged it must be replaced by CTEK or its authorized representative. The charger casing can be cleaned using a damp cloth and mild cleaning agent. Remove the plug from the power socket before cleaning.

LIMITED WARRANTY

CTEK SWEDEN AB, Rostugnsv. 3, SE-776 70 VIKMANSHYTTAN, SWEDEN issues this limited warranty to the original purchaser of this product. This limited warranty is not transferable and is only valid for non-commercial use. CTEK SWEDEN AB warrants this unit for 5 years from the date of purchase against defect workmanship or material. It is the obligation of the purchaser to forward the unit together with proof of purchase to the manufacturer or its representative with transportation cost prepaid. This warranty is void if the unit is abused, handled carelessly or repaired by anyone other than CTEK SWEDEN AB or its authorized representative. CTEK SWEDEN AB makes no warranty other than this limited warranty and expressly excludes any implied warranty including any warranty for consequential damages. This is the only expressed limited warranty and CTEK SWEDEN AB neither assumes nor authorizes anyone to assume or make any other obligation towards the product other than this limited warranty.

DECLARATION OF CONFORMITY

CTEK SWEDEN AB, Rostugnsvägen 3, SE-776 70 VIKMANSHYTTAN, Sweden, hereby declares under sole responsibility that the M300 battery charger, to which this declaration relates, conforms with the following standards: EN60335-1, EN60335-2-29 following the provisions of directive 73/23/EEC amended by 93/68/EEC and EN61000-3-3, EN61000-3-2, EN55014-1, EN55014-2 following the provisions of directive 89/336/EEC amended by 92/31/EEC and 93/68/EEC.

CTEK PRODUCTS ARE PROTECTED BY

2010-01-27

Patents	Designs	Trade marks
EP1618643	RCD 000509617	CTM TMA669987
SE525604	US D571179	CTM 844303
US7541778B2	US D575225	CTM 372715
EP1744432 pending	US D581356	CTM 3151800
EP1483817 pending	US D580853	CTM 405811
SE524203	RCD 321216	CTM 1461716 pending
US7005832B2	RCD 200830199948X pending	
EP1716626 pending	RCD 000911839	
SE526631	RCD 081418	
US-2006-0009160-A1 pending	US D29/319135 pending	
EP1903658 pending	RCD 001119911	
EP1483818	RCD 321197	
US7629774	RCD 321198	
SE528232	RCD 200830120183.6 pending	
EP09170640.8 pending	ZL200830120184.0	
US12/564360 pending	RCD 000835541	
EP09180286.8 pending	US D596125	
US12/646405 pending	US D596126	

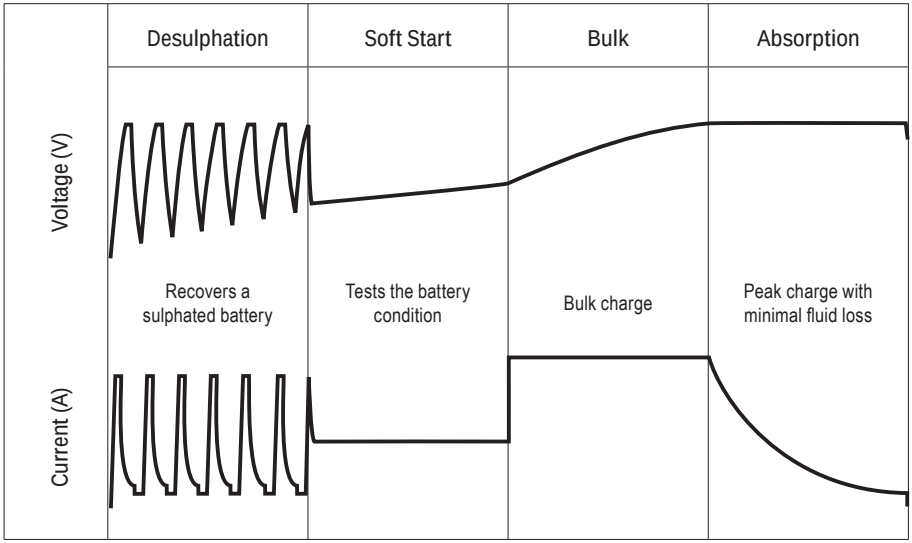
SUPPORT

CTEK offers a professional custom support: www.ctek.com.
For latest revised user manual see www.ctek.com. By e-mail: info@ctek.se,
by telephone: +46(0) 225 351 80, by fax +46(0) 225 351 95.
By mail: CTEK SWEDEN AB, Rostugnsvägen 3, SE-776 70 VIKMANSHYTTAN, SWEDEN.

VIKMANSHYTTAN, SWEDEN 2010-06-01

Jarl Uggla, President
CTEK SWEDEN AB

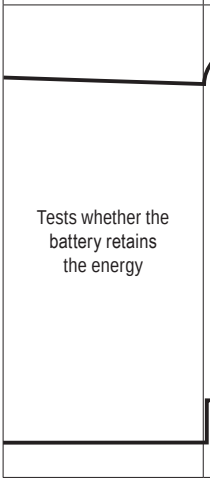
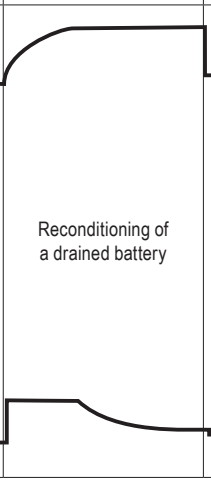
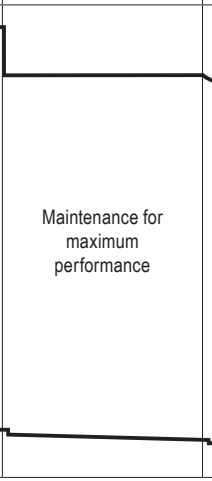
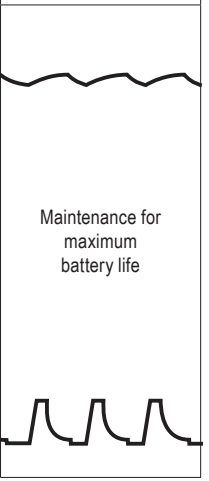
PROGRAM DESCRIPTION



M300 PARAMETERS

Mode	Desulphation	Soft Start	Bulk	Absorption
NORMAL or RECOND	YES	Max 4h or until the voltage reaches 12.6V.	25A for max 20h. NIGHT Mode max 5A.	14.4V max 16h.

Note: In NIGHT Mode the M300 operates in NORMAL Mode with reduced current and disabled fan. The unit automatically returns to NORMAL after 8h.

Analysis	Recond	Float	Pulse
			
Tests whether the battery retains the energy	Reconditioning of a drained battery	Maintenance for maximum performance	Maintenance for maximum battery life

Analysis	Recond	Float	Pulse
Warning indication if voltage drops to 12.0V in 3 minutes.	Max 15.8V and 3A for 4h for deeply discharged batteries. Otherwise for 30 minutes (only in Recond mode).	13.6V with max 25A for max 10 days.	Pulse start at 12.7V, max voltage 14.4V.

M300 STARTER

Battery charger

For lead-acid batteries

User Manual and guide to professional battery charging for Starter and Deep Cycle batteries.

Model XS 800

GB

INTRODUCTION

Congratulations on your purchase of your new professional M300 STARTER Switch Mode Charger with Pulse Maintenance. M300 STARTER is a member of a family of professional chargers from CTEK SWEDEN AB. It represents the state-of-the-art technology for battery charging. A M300 STARTER will prolong the lifetime of your battery. Read this user manual and follow the instructions carefully before using the charger.

SAFETY

- The charger is designed to charge 12V lead-acid batteries from 1.2 to 32Ah. However, the charger can maintain batteries up to 100Ah. Do not use the charger for any other purpose.
- Use safety glasses and turn your head away when connecting or disconnecting a battery.
- Battery acid is corosive. Rinse immediately with water if acid comes into contact with skin or eyes. Seek medical advice.
- Make sure that the cable is not pinched or in contact with warm surfaces or sharp edges.
- While charging, a battery can emit explosive gases, so it is important to avoid sparks in the immediate area.
- Always provide for proper ventilation during charging.
- Avoid covering the charger.
- Make sure that the electrical cable does not come into contact with water.
- Never charge a frozen battery.
- Never charge a damaged battery.
- Do not place the charger on the battery while charging.
- The electrical connection must fulfil the national heavy current requirements.
- Check the cabling in the charger before use. Make sure there are no cracks in the cabling or in the protective covering. A charger with damaged cables may not be used.
- Always check that the charger has gone over to maintenance charging mode before leaving the charger unattended and connected for long periods. If the charger had not gone over to maintenance charging within 3 days, this is an indication of a problem. In this case the charger must be disconnected manually.
- All batteries fail sooner or later. A battery that fails during charging is normally taken care of by the chargers advanced control, but certain uncommon errors in the battery can still arise. Don't leave the battery charger unattended for a longer period of time.
- Only mount the charger on a flat surface.
- This equipment may not be used by children or by those who can not read and understand the manual if they are not supervised by a responsible person who can guarantee that the battery charger is being used in a safe manner. Store and use the battery charger out of the reach of children. Make sure that children do not play with the battery charger.

BATTERY TYPES

The following recommendations should only be considered as guidelines. In the event of uncertainty always refer to the battery manufacturer's recommendations.
M300 STARTER is suitable for charging all types of 12V lead-acid batteries: open batteries, MF, AGM and most GEL-batteries. Battery sizes from 1.2 to 32Ah. The charger can maintain batteries up to 100Ah.

CHARGING

Charging batteries mounted in a vehicle:
1. The power cord should be disconnected before connecting or disconnecting the battery leads.
2. Identify the pole that is grounded (attached to the chassis). Ground is normally connected to the negative terminal.
3. Charging a negatively grounded battery. Connect the red wire to the positive pole of the battery and the black cable to the vehicle's chassis. Be careful not to connect the black cable in the vicinity of a fuel pipe or the battery.
4. Charging a positively grounded battery. Connect the black wire to the negative pole of the battery and the red cable to the vehicle's chassis. Be careful not to connect the red cable in the vicinity of a fuel pipe or the battery.

Charging of a battery not connected to a vehicle:
1. The power cord should be disconnected before connecting or disconnecting the battery leads.
2. Connect the red wire to the positive pole of the battery and the black cable to the negative pole.

Connecting the provided cables with eyelet terminals:
Make sure that the cable is not being pinched or in contact with warm surfaces or sharp edges. When the cable is mounted on the battery, it should not be connected to the charger. Connect the eyelet terminals to the battery's poles - the red cable to the positive pole and the black cable to the negative pole. After this, the quick contact can be connected.

Reverse Polarity Protection
If the battery cables are connected incorrectly, the reverse polarity protection will make sure that the charger and the battery are not damaged. In this case, the red warning lamp ❗ will be lit.

Start charging
1. Once you have checked that the battery leads have been connected correctly, you can start charging by connecting the charger to the wall socket. If the battery leads have been connected incorrectly the polarity reversing protection will ensure that neither the charger nor the battery will be damaged. The fault indicating lamp ❗ will then come on. If this is the case, start from point 1 under "Connecting the charger..."
2. The charging lamp or the maintenance charging lamp will now come on. When the maintenance charging lamp comes on the battery is fully charged. When the battery's voltage drops the charger will send a pulse to the battery. The pulse length depends on how much the voltage has dropped. The charger can be connected for months.
3. If nothing happens. If none of the lamps come on this may be due to the connection to the battery or chassis is poor or that the battery is faulty or has a too low terminal voltage. Another cause may be a lack of voltage in the wall socket.
4. Charging can be stopped at any time by disconnecting the charger's power cord. Always disconnect the power cord before disconnecting the battery leads. When you stop charging a battery fitted in a vehicle you should always disconnect the battery lead from the chassis before you disconnect the other battery lead.

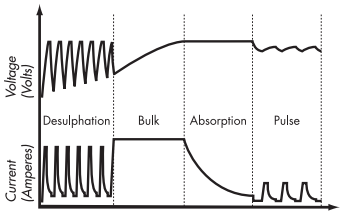
5. If the charging lamp and maintenance charging lamp alternately flash the reason for this is the following:

- If the lamps flash a few times per second then the battery is probably sulphated. If the lamp flashes more than 60 minutes the battery should be replaced.
- If the flashing occurs with a few minutes' interval then the battery has a high self-discharge and may need to be replaced.

CHARGING PHASES

M300 STARTER has a four step fully automatic charging cycle. At the start of charging the battery charger delivers maximum current to the battery and the battery voltage increases constantly to a set level of 14.4V. At this point the voltage will be regulated and kept constant while the charging current is successively lowered. Once the charging current has dropped below 0.4A the charger switches to maintenance charging.
If the battery is loaded and the battery's terminal voltage drops to 12.9V the charger automatically switches back to the beginning of the four step cycle. The charger requires a reverse voltage from the battery of at least 6V to start the charging cycle, this means that if the battery is so deeply discharged that the terminal voltage is lower than 6V the charger cannot charge the battery in question. A normal discharged battery has a terminal voltage of 10.5V.

Charging phases:



Desulphation - Desulphation with pulsing for sulphated batteries.
Bulk - Main charge when 80% of charging takes place. The charger delivers a constant current until the terminal voltage has risen to the set level.
Absorption - Complete charge up to virtually 100%. The terminal voltage is maintained at the set level. During this phase the current drops successively so the terminal voltage does not become too high. If the absorption phase has been in progress for more than 18 hours the charger switches to maintenance charging. This function prevents damage if the battery is faulty.
Pulse - Maintenance charging. State of charge varies between 95% and 100%. The battery receives a pulse when the voltage drops. Keeps the battery in perfect condition when it is not used. The charger can be connected for months at a time. If possible, check the water level in the battery.

TEMPERATURE PROTECTION

M300 STARTER is protected from being overheated. The power will be reduced if the ambient temperature is raised.

MAINTENANCE

The charger is maintenance free. Note that disassembly of the charger is not permitted and will void the warranty. If the power cord is damaged, the charger must be left to the reseller for maintenance. The case can be cleaned with a soft damp cloth and mild cleanser. The charger should be disconnected from the power while cleaning.

EQUIPMENT

M300 STARTER is delivered with a set of battery leads with battery pole clamps and a set of battery leads with eyelet terminals.

WARRANTY

CTEK SWEDEN AB, Rostugnsvägen 3, SE-776 70 VIKMANSHYTTAN, SWEDEN provides a limited warranty to the original purchaser of this product. This limited warranty is not transferable. The unit is warranted against defective workmanship or materials for 5 years from the date of purchase. The customer must return the product together with the original purchase receipt to the place of purchase. This warranty is void if the unit is handled carelessly, opened or repaired by anyone other than CTEK SWEDEN AB or its authorized representative. CTEK SWEDEN AB makes no warranty other than this limited warranty and expressly excludes any implied warranty including any warranty for consequential damages. This is the only expressed limited warranty and CTEK SWEDEN AB neither assumes nor authorizes anyone to assume or make any other obligation towards the product other than his limited warranty.

TECHNICAL SPECIFICATION

Model	XS 800
Voltage AC	170–260VAC, 50–60Hz
Back current drain*	< 1Ah/month
Voltage	Charging Voltage Nominal: 12V; 14.4V
Ripple**	Max 50mV rms, max 0.05A
Current	0.8A max
Ambient Temperature	-20°C to +50°C, power is reduced automatically at increased ambient temperature.
Cooling	Natural convection.
Charging cycle	M300 STARTER is a multistage fully automatic charger
Type of batteries	All types of 12V lead-acid batteries (Wet, MF, VRLA, AGM and GEL).
Battery capacity	1.2–32Ah, up to 100Ah for maintenance.
Dimensions	142 x 51 x 36 mm (L x W x H)
Enclosure class	IP65***
Weight	0.3 kg

*) Back Current Drain is what the charger uses to drain the battery if the power cord is disconnected.

**) Quality of the current and voltage are very important. High current ripple heats up the battery and makes the positive electrode age prematurely. High voltage ripple could harm other equipment connected to the battery. M300 STARTER produces a high quality current and voltage with very low ripple.
***) If the power connected is the flat European contact type, the battery charger has insulation class IP63, except in Switzerland where IP65 is valid.

MANUFACTURER'S DECLARATION

CTEK SWEDEN AB, Rostugnsvägen 3, SE-776 70 VIKMANSHYTTAN, SWEDEN. Declares under sole responsibility that the battery charger M300 STARTER, to which this declaration relates is in conformity with the following LVD standards: EN60335-1, EN60335-2-29 according to the terms of directive 73/23/EEC with the addition of 93/68/EEC. This product also is in agreement with the following EMC standards: EN55011, EN61000-3-3, EN61000-3-2, EN55014-1 and EN55014-2 according to the terms of directive 89/336/EEC with the addition of 92/31/EEC and 93/68/EEC.

The charger comes in different models with different types of electrical plugs. The charger with the flat euro connector is intended for Switzerland.

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CHARGING TIME

The table shows the length of time for bulk charging.

Battery size (Ah)	Time to ~80% charge (h)
2	2
8	8
20	20
60	60

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